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To cite this article: Thomas B. Fischer, Urmila Jha-Thakur, Peter Fawcett, Sarah Clement, Samuel Hayes & Julia Nowacki (2018) Consideration of urban green space in impact assessments for health, *Impact Assessment and Project Appraisal*, 36:1, 32-44, DOI: 10.1080/14615517.2017.1364021

To link to this article: <https://doi.org/10.1080/14615517.2017.1364021>



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Published online: 06 Nov 2017.



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Consideration of urban green space in impact assessments for health

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ABSTRACT

This paper explores how health aspects connected with the planning of urban green space are currently supported through two types of impact assessments: health impact assessment (HIA) and environmental assessment, including strategic environmental assessment (SEA) of policies, plans and programmes and environmental impact assessment (EIA) of projects. Seven HIAs and five EIAs/SEAs from the UK, the US, the Netherlands, Austria and Germany are reviewed, using an analytical framework designed on the basis of a literature review. An important finding is that whilst all HIAs follow a problem-/objectives-driven approach, designing guidelines for potential future projects, all EIAs/SEAs use an impact-driven approach, focusing on the impacts of planned and concrete action. HIAs therefore approach policy, plan, programme and project-making exercises from the *outside*, making suggestions to those working on them to consider certain aspects in the future, rather than working with them on improving things *within* a decision-making process, as is usually the case with EIAs/SEAs.

ARTICLE HISTORY

Received 7 February 2017
Accepted 1 July 2017

KEYWORDS

Health; urban green space; strategic environmental assessment; environmental impact assessment; health impact assessment

Introduction

Urban green space (UGS) can have beneficial impacts on human health, including physical as well as social and psychological aspects. The question as to how positive health and well-being outcomes can be achieved through UGS has attracted increasing research attention in recent years (Coutts 2016). Proposals that seek to increase the provision and usage of green space within urban settings are typically underpinned by the belief that green spaces can help address many of the public health challenges faced by towns and cities (Carmichael et al. 2016). These include lifestyle risks, such as excessive weight and physical inactivity; urban stress and mental health conditions; as well as climatic risk factors, such as air pollution and urban heat islands (Rebmann et al. 2016).

Several recent international declarations and development goals have championed the importance of green space as a determinant of health and well-being. The World Health Organization's (WHO) Parma Declaration on Environment and Health (2010) included a commitment to providing each child with 'access to healthy and safe environments', including 'green spaces in which to play and undertake physical activity' (Goal 2, part iv). This aim of ensuring access to 'safe and inclusive greenspaces' is further supported by the United Nation's (UN) 2015 Sustainable Development Goals (SDGs), with SDG 11.7 setting the target that 'by 2030, provide universal access to safe, inclusive and accessible, green and public spaces,

particularly for women and children, older persons and persons with disabilities'. Green space is, moreover, embedded within the WHO Health 2020 European health policy framework under the priority area of creating 'supportive environments and resilient communities'.

This paper is based on a report which was produced for the WHO, examining the role of impact assessment (IA) in supporting the consideration of the health aspects of UGS. The main aim of the paper is to look at how the consideration of the health aspects of UGS is supported through two types of impact assessments: health impact assessment (HIA) and environmental assessment, including strategic environmental assessment (SEA) of policies, plans and programmes and environmental impact assessment (EIA) of projects. In this context, practices in the UK, the Netherlands, Germany, Austria and the US are explored.

HIA can be an important public health decision support tool, benefitting the decision-making process in several ways – including drawing decision-makers' attention to health-related issues that might otherwise receive limited consideration, increasing transparency and providing mitigation strategies for use in reducing any negative impacts and strengthening any possible benefits. It is the case, however, that to date, HIA has remained predominantly a non-statutory, voluntary exercise (O'Mullane 2013; Cave 2015). Environmental assessment, on the other hand, is legally required in many planning situations in most countries, and human health is an aspect

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This article was originally published with errors. This version has been corrected. Please see Corrigendum (<http://dx.doi.org/10.1080/14615517.2018.1437110>).

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frequently mentioned as one of the important elements to be addressed in it.

In many countries, both SEA and EIA are statutory instruments that need to be formally applied to many plans, programmes and projects, and occasionally also to policies. In the EU, SEA has been formally required to consider human health for over a decade, based on the SEA Directive 42/2001/EC (Fischer et al. 2010). Furthermore, EIA has been asked to assess impacts on human well-being for 30 years, based on Directive 85/337/EC. The revised EIA Directive (2014/52/EU), to be transposed by EU member states by May 2017, is now also explicitly asking for the assessment of impacts on human health (Fischer et al. 2016).

UGS can positively contribute to the physical fabric of a town or city, with initiatives aimed at increasing and/or improving the provision of UGS taking many forms and scales. The design, planning and development of UGS requires that those actors involved, such as planning and health sector practitioners, engage in a decision-making process (either formal or informal). This process of decision-making offers a space for the attributes of the UGS initiative, its target audience, and its intended outcomes to be explored and decided upon. It is here, within this decision-making process that IA can be used to support the systematic and proactive consideration of potential health impacts. To understand how health and green space are currently considered in IA, subsequently, a review of the literature on the connections of green space and health is presented. This is followed by a review of 12 HIA, SEA and EIA cases on the current consideration of green space interventions and the connections made with health in this context. A discussion of the results is provided and finally, conclusions are drawn and recommendations for improving practice are given.

Green space and its potential impact on health

There is a growing body of research publications looking at the link between green space and health and in this context, also well-being. This has revealed a number of important findings, including, for example, a lower mortality rate in neighbourhoods with higher levels of green space provision (Villeneuve et al. 2012). Accessible green space, coupled with involvement in local community activities, has also been linked to longevity among senior citizens in densely populated urban areas (Takano et al. 2002). More generally, populations exposed to living environments high in accessible green space have been shown to have lower overall rates of disease (Maas et al. 2009; Richardson et al. 2013) and disease-related mortality (Gascon et al. 2016).

Green spaces have been found to provide multiple direct and subtler, indirect effects that can positively influence health and well-being. More generally, neighbourhood green space has been linked to greater levels

of physical activity (Morris 2003; Toftager et al. 2011; Mytton et al. 2012; Sanders et al. 2015). Findings from a number of studies looking at obesity levels have also pointed to proximity to green space being linked to higher physical activity levels and lower risks of obesity (Ellaway et al. 2005; Toftager et al. 2011). Furthermore, UGS, such as green corridors can improve healthy access to services and amenities, by supporting, for example, safe walking and cycling.

While physical health may appear to be a readily observable benefit of green space, some strong statistically significant evidence exists around the links between green spaces and mental health (de Vries 2010; van den Berg and van den Berg 2015; Gascon et al. 2015). Green spaces have been identified as having the ability to serve as a buffer against the detrimental impacts of lifestyle stresses, with health benefits being mediated through the process of stress reduction (Grahn and Stigsdottir 2003; Thompson et al. 2012). This is more pronounced for more deprived communities (Kuo 2001).

The provision of green space can also provide a mitigation strategy to counteract potentially damaging health effects of numerous climatic factors. In a recent meta-analysis, all types of green space were found to be associated with some form of relief from heat stress, and urban heat island and air pollution reduction (Zupancic et al. 2015). Studies employing modelling techniques have been able to demonstrate that urban trees have the potential to remove significant quantities of pollutants, consequently leading to air quality improvements (Nowak et al. 2006). There is also moderate evidence to support the assumption that vegetation can reduce the negative perceptions of noise (Dzhambov and Dimitrova 2014), and green space can play an important role in urban water management and purification (Zhang et al. 2015). Finally, green spaces have the ability to contribute to key urban agendas, which besides health and well-being also include social inclusion, sustainability and urban renewal (Swanwick et al. 2003).

From a decision-making perspective, it is important to be aware that green space development can potentially have a paradoxical dimension. While it can have many positive health and well-being impacts, it may also have potentially negative effects. This includes exposure to air pollution, particularly in green space located near heavy trafficked roads (Carlisle and Sharp 2001), and disease vectors and zoonotic infections, of which Lyme disease is a leading concern across Europe (Medlock and Leach 2015). Furthermore, there is potential for increased allergenic reactions depending on the vegetation used (Dadvand et al. 2014). Another key area of consideration is that through improving a neighbourhood's environmental quality it is possible that green space may lead to neighbourhood gentrification. This, in turn, may lead to the displacement of the very residents that the underlying strategy was intended to benefit (Wolch et al. 2014). Finally, green spaces at times can attract criminal activity

(e.g. drugs related) and anti-social behaviour (Wolch et al. 2014).

These studies illustrate the complexities surrounding green space. They also strengthen the case for why it is important that prospective green space interventions are subjected to an assessment of the potential health impacts (both positive and negative). Whilst there can be different reasons for negative impacts, they can often be avoided through effective planning and management, for example, by ensuring adequate lighting is provided, creating safe playgrounds for children, vegetation choice and general maintenance.

Green space and health in HIA, EIA and SEA

In this section, we will firstly define HIA and present the results of a review of HIA documents linking green space and health from several countries. Next, ways in which SEA and EIA can make a connection between UGS interventions and health will be explored.

Health impact assessments (HIAs)

An initial review of documents from different countries that link green space development and health, and that are labelled HIA was conducted. This revealed that the term HIA is used in a range of situations, representing a number of very different approaches. This is similar to what has been observed for other impact assessment instruments, with particular labels not necessarily matching available definitions of instruments (Fischer and Onyango 2012).

Before starting to evaluate HIA's role with regards to the impact of UGS interventions, it is important to establish a typology, allowing consideration of practice in a context-specific way. Any conclusions and recommendations need to take the specific context and approach of HIA into account.

As a starting point, we reflect on commonly used definitions of HIA. Most of these revolve around it being a:

means of assessing the health impacts of policies, plans and projects in diverse economic sectors [e.g. transport, agriculture or housing], using quantitative, qualitative and participatory techniques. (<http://www.who.int/hia/en/>)

HIA is commonly understood as an *ex ante* assessment tool, i.e. health impacts are anticipated and, if necessary mitigated or enhanced before development is implemented. Furthermore, it is suggested that HIA should mainly focus on 'unintended effects' (DH 2010; Orenstein 2012).

In practice, the term has been found to be also used for assessments that differ from the understanding portrayed above. Thus, the term is used as follows:

- (1) Assessments of products, e.g. artificial turf (Toronto Public Health 2015).
- (2) Promotional ('problem-driven') guidelines for how 'healthy development' may be supported and/or health and well-being be promoted through the enhanced usage of green spaces, e.g. with regards to tackling obesity (South Carolina Institute of Medicine and Public Health 2013), regeneration (Limerick Regeneration Agencies 2008) or [in]adequate housing (Curry County 2013),
- (3) Toolkits for establishing health impacts of UGS interventions (San Francisco Department of Public Health 2007).
- (4) Ex-post-healthy development optimization support studies for planned projects that have already obtained development consent (Gobierno Vasco 2009).
- (5) Ex ante HIAs applied in policy, plan, programme and project (PPPP) making processes, leading towards development consent (or equivalent); at times in the context of SEA and EIA or in parallel to them; with regards to green space, two types of HIA can be distinguished:
 - (a) HIA for green space initiatives, policies, plans, programmes or projects (Bristol City Council 2013; Ison 2007; see also Richardson et al. 2012).
 - (b) HIAs for other sectors' policies, plans, programmes and projects, e.g. spatial/land use (CQGRD 2012), transport (Swedish National Institute of Public Health 2005), energy (Buroni 2007) or waste (Simpson 2005). These can be applied from within the underlying PPPP process (e.g. by a responsible authority), but also from outside that process (e.g. by an external organization) and may raise important UGS issues.

For our review of practice of ex ante IAs, we were not able to identify a good practice category 5b HIA case for green space interventions. Subsequently, therefore, apart from examples from category 5a, we will also use two examples from approaches 2 and 3, which apply an ex ante approach to tackling problems. Category 1 and 4 IAs were not further considered, as 1 focuses on products rather than planning and category 4 is applied in an ex-post-monitoring context.

EIA and SEA

EIA of projects and SEA of policies, plans and programmes have their origins in public health. In many countries and systems they were developed on the basis of physical environmental issues and problems that had negative health implications, including environmental pollution and associated poor water and air quality (Fischer and Nadeem 2014).

In practice (though not necessarily conceptually), definitional problems with regards to what counts as SEA and EIA are less of an issue, as they are usually statutory assessment tools with definitions provided in the legislation and associated guidance underlying them. Generally speaking, EIA and SEA are *ex ante* assessment instruments that aim at assessing the potential significant negative, along with any positive environmental effects of policies, plans, programmes and projects (PPPPs) that are under preparation. SEA and EIA (in combination referred to here as EA) are pro-active rather than reactive in that they seek to influence PPPPs. The consideration of different alternatives to achieve stated aims and objectives is at the heart of EA.

EIA is a requirement in nearly all countries in the world. SEA is now also routinely applied in spatial planning and programme-making processes in over 60 countries globally (including the 28 EU member states; see Fischer 2014; IAEA 2017). An important rationale for their application is the support of liveable and healthy environments. This means putting forward ideas to develop green and blue urban infrastructure and spaces should be a key component of SEA and EIA. Justification should be connected with the positive implications for health and environmental issues such as air quality, climatic effects, noise reduction, biodiversity conservation and enhancement, flood management, physical activity, social cohesion, attractiveness of local area, mental health and others (following Institute for European Environmental Policy 2016).

With regards to the health effects of UGS interventions, the question to be addressed in EA is not just whether there are green spaces that are affected and/or to be developed. Rather, the size and type of green space intervention and the management of green space (e.g. the use of pesticides) are important. Furthermore, the distance of green spaces from those that are supposed to benefit from them needs to be considered (Cvejić et al. 2015). In order to more fully establish the benefits from green spaces, applying the concept of ecosystem services may be particularly useful (Bolund and Hunhammar 1999).

The main interest of the research project underlying this paper was on how EA considered health through UGS. Therefore, EAs were sought and reviewed that made that connection. The methodology underlying the review is subsequently explained.

Review methodology

The methodology was devised based on a desire by the WHO 'to identify and evaluate HIAs, EIAs and SEAs that [...] provide] examples for the consideration of green space and its linkages with/impacts on human health' (WHO 2016).

Three main approaches were used to identify potentially suitable cases (i.e. cases that upon first screening

were identified to include elements of green space planning and human health and that involved SEA, EIA or HIA):

- (1) Web searches (mainly Google Scholar and Google), using the keywords 'Health Impact Assessment', 'Strategic Environmental Assessment', 'Environmental Impact Assessment', 'Green Spaces', 'Green Infrastructure', 'health'. Based on this, six cases were selected for inclusion in the study.
- (2) Going through an HIA database, previously compiled by the WHO, European Regional Office. This was the basis for five cases which were included in the study.
- (3) Contacting HIA/SEA/EIA and public health experts from 15 EU member states. Only one case was identified, based on what one of the experts said (Vienna).

Being based on a WHO European Regional Office project means the emphasis of the research underlying this paper was on European experiences. Here, a range of countries were supposed to be included. However, because the initial WHO search underlying the associated WHO database had identified a wide range of HIA examples from the USA, the decision was taken to also include two of these examples as a point of reference for European practices. The cases selected are:

- (1) **HIA** of the bid to the Big Lottery Funding for the Connswater Community Greenway in East Belfast, *Northern Ireland*, 2007 (project-focused rapid appraisal);
- (2) Kingswear Road, Torpoint Road and Haldon Close Development Area **HIA** (Health Impact Statement), *England*, 2013 (master plan-focused rapid appraisal);
- (3) West Rhyl Greenspace Project (WRGP) **HIA**, *Wales*, 2014 (project-focused rapid appraisal);
- (4) An **HIA** concerning the Gardens for People project in Stonehouse Plymouth, *England*, 2002 (policy-focused rapid appraisal);
- (5) **HIA** of the draft East End Local Development Strategy entitled 'Changing Places: Changing Lives', *Scotland*, 2007 (policy-focused rapid appraisal);
- (6) Eastern Neighbourhoods Community **HIA** (ENCHIA), *USA*, 2007 (problem-driven HIA, analysing an existing situation and resulting in recommendations);
- (7) **HIA** of Atlanta Regional Plan 2040, *USA*, 2012 (problem-driven HIA, analysing an existing situation and resulting in recommendations);
- (8) Gebiedsontwikkeling Brainport Park Eindhoven – Milieueffectrapport (Area Development Plan Brainport Park **EIA**), *The Netherlands*, 2015;

- (9) Vienna main railway station and associated **EIA** 'urban development' (Hauptbahnhof Wien, UVPs Städtebau, Bahn Infrastruktur und Strassenbau), *Austria*, 2008;
- (10) Landschaftsplan Göttingen and associated **SEA** for the Local Land Use Plan (Landschaftsplan und SUP des FNP Göttingen), *Germany*, 2015;
- (11) Local Transport Plan Plymouth **SEA**, *England*, 2010.
- (12) Glasgow City Plan 2 **SEA**, *Scotland*, 2009; and

Evaluation was conducted by two persons for each case, based on a list of questions on the linkages of IA, green spaces and health that were compiled on the basis of the literature review presented above. Additional questions were included to establish the methodological approach used in the impact assessment (i.e. whether a quantitative and/or qualitative approach was taken). Furthermore, contact was made with a key planning officer responsible for the preparation of each of the cases in order to establish what the perceived impact of the impact assessment on decision-making was. Finally, whether any health-specific monitoring was proposed is included. Box 1 shows the questions/parameters used.

Box 1. Questions for reviewing the 12 IA cases

- Are green spaces included in the HIA/EA? If yes, in what way (as its key focus or as one of a range of categories)?
- Is human health explicitly considered in the HIA/EA? If yes, in what way?
- Are impacts assessed with regards to the following biophysical aspects?
 - climate function
 - air quality
 - noise
 - water/flooding
 - fauna and flora
- Are the following social and economic (equity) aspects addressed?
 - social cohesion/exclusion/support
 - physical activity
 - mental well-being (e.g. stress, self-esteem, confidence)
 - neighbourhood environment/attractiveness
 - crime and anti-social behaviour
 - improved environmental and 'healthy' (i.e. safe walking and cycling) access to services/amenities
- Is an assessment of positive and negative impacts provided?
- What methodological approach is used?
 - Qualitative

- Quantitative
- What is the impact of the IA on any decisions with regards to influencing sites or design (based on the perceptions of the key planning officer)?
 - Major
 - Moderate
 - Minor
- Is there any health monitoring happening?
 - Formal
 - Informal

Introduction of reviewed IAs

Subsequently, each of the reviewed IAs is briefly introduced. In this context, the underlying policy, plan, programme or project is described and the purpose of the IA is explained.

The Connswater Community Greenway (CCG) HIA (Northern Ireland)

This is an urban park project in East Belfast by Belfast City Council. The aim of the project was to deliver a 9-km linear park through East Belfast, which is supposed to serve as a multifunctional space for education and learning, social and community interaction, transportation and connectivity and other activities. In support of the preparation of the bid to the Big Lottery Fund for the CCG, Belfast Healthy Cities commissioned a specialist practitioner to perform an HIA of the project proposal (final report published in 2007).

The purpose of the HIA was twofold: to (a) identify the potential health and well-being impacts of the development and (b) suggest ways to maximize the development's overall health gain. In addition, the HIA process sought to introduce the concept of healthy urban planning to Belfast. Focusing on 17 key outputs of the proposal, this project-level HIA qualitatively identified and assessed potential pathways and outcomes to health and well-being. This included a desktop appraisal (including a summary of relevant published literature), consultation with stakeholders at a participatory workshop and supplementation of results through extraction of data from evaluation forms completed at an earlier project-related community consultation.

Kingswear Road, Torpoint Road and Haldon Close Development Area HIA (England)

Preparing the 'Proposed Plan for Knowle West' started in 2009. Endorsed by Bristol City Council in 2012, the plan identified land at three sites as a potential development area for new homes and green space. An external consultancy, appointed by the local council and the landowner,

led on the preparation of the plan and a planning application for the proposed development area. This included seeking permission to develop new homes, demolishing existing (empty) buildings and enhancing the central public open space.

Following the local draft practice note 'Planning a Healthier Bristol – Assessing the health impacts of development' (consultation version, February 2013), a Health Impact Statement was produced. This served as an accompaniment to the proposal's Planning, Design and Access Statement.

West Rhyl Green space project (WRGP) HIA (Wales)

This project (completed in 2015) is situated in the county of Denbighshire on the north-east coast of Wales. The local county council appointed a team of landscape architects to design and deliver the project as part of an overarching housing-led regeneration scheme with an aim to create a vibrant community, construct new energy efficient homes, create an attractive and relaxing new green space and provide new retail opportunities. During the initial stages of the project development, efforts were made to ensure that designers and decision-makers were informed about the importance of green space, and that health and well-being issues were integrated into the design process prior to the submission of the planning application.

To assist this process, an HIA was performed for the purposes of shaping the tender brief, and the future direction, of the green space element of the wider housing scheme. Following the systematic methodology described in the Welsh national HIA guidance 'HIA: A Practical Guide' (2012), an HIA was undertaken in 2014. Two main appraisal techniques were employed: a participatory stakeholder workshop, which served as a platform for community and organizational knowledge gathering, and a desktop appraisal.

Plymouth Gardens for People Project HIA (England)

The Gardens for People Project is an initiative that aimed to build capacity for local people to sustain green spaces in their community. The project involved partnership working between Groundwork Plymouth (a community charity) and the City Council's Housing for People Project. A key aim of the project was to provide residents with the skills and expertise necessary to maintain a community garden, a process which involved training, practical tools and the building of capacity and confidence to undertake the work.

The Plymouth Health Action Zone (PHAZ) HIA group acted as the steering group for the project. An HIA was used as a tool for promoting public health, reducing inequalities and increasing community participation

in decision-making. An independent HIA facilitator was commissioned to undertake a prospective policy-level community assessment of the concept of the project. Next to identifying the potential health impacts of the project, the HIA aimed to raise the profile of the health outcomes of gardening projects and local community engagement in the assessment and project decision-making process. This is said to be an early example of an HIA undertaken for a small community garden accessible only to residents of a single block of social housing flats.

HIA of the draft Glasgow East End Local Development Strategy (Scotland)

Within Glasgow City Plan 2, the Clyde Gateway, which encompasses a substantial area of land to the east of the city centre, was identified as a key potential feature of the city's future development. This includes the regeneration of the East End. The Local Development Strategy for the East End (EELDS) – *Changing Places: Changing Lives* – was approved by the Council in 2008, and aims to create a vibrant, new city district through a process of reinvention and reconnection. The strategic objectives of the EELDS include increasing housing and employment opportunities, modernizing infrastructure to support sustainable development and to develop and maintain a Green Network which offers 'safe, stimulating, and healthy environments'.

In 2007, an HIA was undertaken of a draft (November 2006) version of the EELDS. It was commissioned by the Glasgow Centre for Population Health, and was performed by a specialist practitioner in HIA. The HIA involved a participatory stakeholder workshop (which included a half-day site visit), and a desktop study (literature review). Qualitative in nature, the assessment entailed stakeholder groups being asked to consider the potential impacts of the EELDS on the health and well-being of the existing community. To facilitate this, stakeholders were provided with a prioritized list of health determinants (based on the EELDS) and baseline community health status with which to identify potential positive and negative health impacts.

San Francisco Eastern Neighbourhoods Community HIA (USA)

Over recent decades, a combination of rapid growth in housing demand, neighbourhood gentrification and increasing land use conflicts has placed strain on the socio-economic well-being of San Francisco's Eastern Neighbourhoods. In 2002, the city's planning department launched a neighbourhood planning process to address existing and future land use conflicts. This process resulted in revisions to existing urban development policies, the creation of new neighbourhood plans and

the potential rezoning of current land uses to accommodate new housing next to existing light industry. The compiled rezoning options were legally required to be subject to an EIA process. The local planning department decided not to integrate health considerations into the process – citing practical and conceptual reasons, such as the focus of EIA being explicitly that of direct environmental impacts.

The San Francisco Department of Health subsequently convened and led an 18-month independent, parallel and collaborative HIA process – The Eastern Neighbourhoods Community HIA (ENCHIA). The aim was to understand how health gains can be maximized from land use development, and to analyse the likely impacts of the Eastern Neighbourhoods land use plans and zoning controls. Delays in the publication of these plans, however, frustrated this process. This, in turn, led to the refocusing of efforts towards the creation of a general assessment tool and methodology that could be applied to assess future land use development proposals.

The conclusion of the ENCHIA process was the creation of the city's first Healthy Development Management Tool. The tool brings together all the products of the ENCHIA process, providing decision-makers with a set of metrics to use in the assessment of urban development PPPs. To aid with application and dissemination, the tool was converted into an online resource and accompanying data depository (<http://www.sfindicatortoproject.org/>).

HIA of the Atlanta regional plan 2040 (USA)

PLAN 2040 is a long-term (29 years) regional comprehensive plan prepared for the Atlanta region by the Atlanta Regional Commission. It was adopted in July 2011. The plan integrates multiple aspects of regional planning. This included bringing together land use and transportation policies. In addition to housing, green space, water and air quality, and changing demographic and economic scenarios were considered. This regional planning effort also includes a new Regional Transportation Plan, a six-year priority Transportation Improvement Plan and a comprehensive Regional Development Plan for the region's 10-county core.

The PLAN 2040 HIA represents one of the earliest HIAs of a regional comprehensive plan for a major metropolitan area in the US. It was conducted before the plan was adopted. This comprehensive, policy-level HIA is neither explicitly concurrent nor prospective, but both at once. The purpose of the HIA is to develop an understanding of how regional planning may impact health and well-being, to build capacity for future HIA practice and to establish an evidence-based framework for assessing complex, comprehensive and long-term policies, plans and programmes.

Area Development Plan Brainport Park EIA (The Netherlands)

This is an EIA for the development of a major area in the north-western part of the city of Eindhoven. The proposed development includes a range of knowledge-intensive industries and supporting high-tech facilities. In this context, the plan talks about a campus idea, consisting of developments that complement each other. Furthermore, a green network of parks (including a major existing park), green spaces and a green corridor are covered. Planning consent is to be achieved through a process consisting of three master plans: one comprehensive spatial plan, one accessibility plan and one plan for phase one of the development of the Brainport Park. A main aim is the development of a high spatial quality of the area through an attractive and green environment. A green corridor cutting through the area from the north-west to the south-east into the city centre is a key aspect of the development.

The EIA assessed three infrastructure and urban development alternatives, using a life cycle approach. This was pursued in terms of 12 main assessment themes that also included human health. The development aims at exerting leadership in health and well-being opportunities. Furthermore, high-quality living areas are to be developed that should take advantage of a green and healthy environment.

Vienna main railway station and associated EIA (Austria)

This EIA was prepared in 2007/2008 and focused on the development of a new main railway station in Vienna along with a range of other associated developments and other urban regeneration measures along about 6 km of railway tracks. Developments include a new urban quarter on 59 ha for 5 000 new apartments and a total of 10 000 new residents, as well as around 550 000 m² of office space for 25 000 workers. The development also includes a new urban high-quality park of 8 ha along with new schools and a nursery. A green corridor is included, cutting through the entire length of the project. The new development will replace an existing freight railway terminal, which will move to the edge of the city, making space for what is seen to be more suitable inner city developments. The new park is intended to benefit all Vienna residents, and in particular the new residents and office workers that can use it for, e.g. recreational purposes and outdoor exercise.

The EIA itself is tiered with the SEA for the City Development Plan 2005, in which various development alternatives were considered. An accompanying landscape plan was used to design green spaces. Section 3.1 of the EIA report focuses on human beings and there is a dedicated part on human health. The main focus in this context is on noise, air quality and vibrations.

Landschaftsplan Göttingen and SEA for the local land use plan (Germany)

In 2010, the city of Göttingen decided to prepare a statutory and area-wide landscape/environmental development plan (*Landschaftsplan*), along with a revised land use plan. Both plans are closely associated in the German planning system (see Hanusch and Fischer 2011). Work on an associated SEA for both plans started in 2011. Whilst the land use plan establishes the spatial framework for future economic development and population growth, the landscape/environmental development plan considers how development can happen in an environmentally sustainable manner. This includes the development of green and blue corridors and spaces.

The SEA includes an extensive environmental baseline description, based on seven criteria; soil, water, climate/air, biodiversity and biotopes, landscape, human beings and cultural and material assets. The section on human beings mainly focuses on the living environment (residential and open areas). Nearly the entire section is dealing with green corridors and spaces, focusing on recreational aspects and the potential for supporting outdoor activities and exercise. Objectives for each of the seven criteria are established next.

The SEA assessed different options for about 130 development sites within the town. In this context, positive and negative impacts of options on the seven criteria introduced above were assessed. Furthermore, a number of development measures were introduced for various sites. Whilst the assessment extensively uses matrices to show impacts, land use and landscape plans present a number of highly detailed maps.

Plymouth transport plan SEA (England)

A SEA of Plymouth's third Local Transport Plan (LTP; 2011–2026) was conducted in 2009/2010. SEA objectives revolved around air quality, biodiversity, climatic factors, heritage assets, townscape and landscape, noise, water and human health. In this context, a stand-alone HIA was undertaken in parallel with the SEA for parts of the area covered by the SEA. The work was complemented by a number of other studies, including noise impact assessment, sustainable neighbourhood assessment, child safety audit, equality impact assessment, barriers to walking study and a green infrastructure delivery plan. In this context, green spaces were connected with health.

Review results

Table 1 below shows coverage of the criteria introduced in Box 1 for the examined HIAs and SEAs/EIAs.

Of the seven reviewed HIAs, five were from the UK and two from the US. The UK focus reflects the fact that HIA has been practiced in the UK for a number of decades. The review found that several project or policy-focused

HIAs were conducted that were prospective in nature, with their purpose being to inform relevant PPPP actors of potential health impacts. They provide recommendations on how to maximize the overall project/policy health gain. As a secondary purpose, they serve as a mechanism for introducing 'healthy planning concepts' to local spatial policy and planning processes (HIA 1), raising the profile of green space projects (HIA 3,4) and facilitating community engagement in the project or policy development process (HIA 1,3,4).

Of the five reviewed environmental assessments, one EIA was from the Netherlands and the other from Austria. Furthermore, two SEAs were from the UK and one from Germany. All of them focused on environmental and some health impacts, mostly on impacts that were expected to be negative. All EIAs/SEAs were applied in parallel to the underlying plan or project, interacting with them at various points. All of them involved public participation, mostly in the context of the underlying plan and project-making process.

Overall, if considered as two assessment 'groups', it is evident that EIAs/SEAs tend to consider biophysical aspects to a larger extent than HIAs. The two health aspects of 'water/flooding' and 'physical activity' are considered in all the reviewed HIAs and EIAs/SEAs. This is inverse to the situation of social and economic aspects which tend to be considered more completely in HIAs, with the exception of neighbourhood environment (attractiveness), which was also considered in all reviewed EIAs/SEAs. None of the EIAs/SEAs, though, considered crime/anti-social behaviour/violence, whilst this was considered in five of the seven HIAs.

While undertaken for a variety of projects, the HIAs employed similar techniques: participatory stakeholder HIA workshops, underpinned by desktop studies (i.e. a review of published evidence). A broad range of health aspects were considered, especially socio-economic aspects and, to a lesser extent, also biophysical aspects. Whilst both EIAs used qualitative impact prediction techniques in association with a wide range of maps, all SEAs were based in large parts on impact matrices (Fischer 2007).

All HIAs serve as instruments for developing a broader understanding and articulation of how land use development can promote (and protect) health and well-being, for example, through green spaces. In doing so, they aim to fill a perceived 'gap' in existing knowledge and practice around the consideration of health and well-being. In one case, the HIA process was started due to the absence of consideration of health and well-being within the statutory EIA (HIA 6). Moreover, they aim to build capacity for the use of HIA, which is evidenced by their outcomes, including the development of methodological approaches (or 'toolkits'). All environmental assessments focused on impacts, in line with the underlying legal requirements, based on the European EIA and SEA directives. They mainly focused on the avoidance and

Table 1. Coverage of HIAs and SEAs/EIAs.

Aspect	Case											
	HIA 1 – Connswater Community Greenway	HIA 2 – Kingswear Road, Torpoint Road and Haldon Close	HIA 3 –West Rhyl Project	HIA 4 – Gardens for People Project	HIA 5–East End Local Develop-ment Strategy	HIA 6 –Eastern Neigh- bour-hoods Community	HIA 7 – Atlanta Regional Plan 2040	EIA 1 – Brainport Eindhoven	SEA 1 – Land- schafts-plan Göttingen	SEA 2 – Plymouth Local Trans-port Plan (2011–2026)	SEA 3 – Glasgow City Plan 2	
Biophysical aspects:												
Climate function							X		X	X	X	
Air quality				X	X		X	X	X	X	X	
Noise	X			X	X		X	X	X	X	X	
Water/flooding	X	X	X		X		X	X	X	X	X	
Flora & fauna/ biodiversity	X	X	X				X	X	X	X	X	
Social/economic aspects:												
Social cohesion/exclusion/support	X	X	X	X	X	X	X		X	X		
Physical activity	X	X	X	X	X	X	X	X	X	X	X	
Mental well-being (e.g. stress, self-esteem, confidence)	X	X	X	X	X				X		X	
Neighbourhood environ-ment: attractiveness	X	X	X		X	X	X	X	X	X	X	
Crime/anti-social behaviour/violence	X		X	X	X		X					
Improved environmental and healthy access to services/amenities	X	X	X		X	X	X	X		X		
Assessment of impacts:												
Negative	X		X	X	X			X	X	X	X	
Positive	X	X	X	X	X			X	X	X	X	
Methodological approach:												
Qualitative	X	X	X	X	X	X	X	X	X	X	X	
Quantitative								X	X			
Impact on any decisions:												
Major												
Moderate								X	X			
Minor	X		X						X	X	X	
Health monitoring?												
Formal												
Informal	X						X					

■ = 0%; ■ = 1% to ≤ 35%; ■ = 36% to ≤ 65%; ■ = 66% to 99%; ■ = 100%.

Notes: Percentages are calculated by category, i.e. how many HIAs and SEAs/EIAs meet a particular aspect in their respective category.

NB: A basic analysis is provided here on whether or not something was assessed or not. A more detailed analysis on, e.g. the extent to which different aspects were considered was not attempted.

reduction of negative impacts and further possible mitigation. Health-focused monitoring was entirely absent in EIA/SEA, whilst two of the HIAs were associated with what was termed 'informal' monitoring.

Discussion

We acknowledge that in view of the limited number of cases studied, the results presented here need to be discussed and interpreted with some caution. However, despite this limitation, the main trends are consistent and strong. We therefore suggest that they should be used to open up a wider debate on the consideration of health in different types of assessment.

Overall, our review has established that green spaces and associated impacts on human health are considered in HIA, EIA and SEA in different ways and formats. In this context, based on reviewing seven HIAs and five SEAs/EIAs, two main approaches are emerging: (1) one where HIA is used to raise awareness for the role of green infrastructure or to promote specific green infrastructure initiatives based on a perceived existing problems and associated development objectives (problem-driven assessment); and (2) one where (mainly) EIA and SEA are used to assess (negative) impacts of spatial or other sectoral (e.g. transport, energy, waste) policies, plans, programmes and projects, and in this context consider the need for developing green spaces, making reference to possible health implications (impact-driven assessment).

The first (problem-driven) approach usually provides a rich source for exploring the functioning of different types of green (and often also blue) spaces and their potential health implications. Associated documents are often written as quasi-guidance documents to make policy-makers, planners, developers and other stakeholders aware of the role of green spaces. In this context, an important aim is the consideration of green spaces in future planning and associated decisions.

The second (impact-driven) approach is usually associated with a less prominent position of green spaces and health, mainly due to other (and possibly competing) interests and development ideas driving the PPPP underlying the assessment. Whilst at glance, it may, to some, appear that the second approach is less worthy of study as it is more limiting, in particular as green spaces and health often only contribute a small part to the assessment, when it comes to the implementation of green spaces on the ground, it is here where more immediate implementation is usually happening. Furthermore, statutory requirements are usually in place for assessments of the impact-driven approach (EIA and SEA), giving it a more binding character.

The problem-based approach is focused on providing guidance for future projects, whereas the impact-driven approach aims to influence developments by assessing their impacts. Here, the EIA or SEA assesses different options to meet development goals and help to identify

the most suitable option (i.e. one which is healthier and environmentally sustainable). In this context, what has been identified as a major barrier towards achieving this is a reactive approach to assessment, i.e. rather than being used pro-actively to influence design, assessments only test whether (and to what extent) certain objectives are met, and frequently apply a matrix-based 'tick-box' approach. In the professional literature, this reactive approach has been identified as one of the key reasons for IA not being able to develop its full potential (Fischer 2009). One of the main reasons for being reactive is that it is used to 'prove' that a project's decision-making process had incorporated required considerations.

Whilst all EIAs and SEAs considered negative next to (occasionally) some positive impacts, positive effects were at the heart of all HIAs, with two cases focusing not on any impacts but on making suggestions for what healthy development may look like (HIA6, HIA7). There is therefore a tendency to use the legally required EIAs/SEAs as impact-focused instruments, whilst the largely non-statutory HIAs are used more as guidelines to support 'healthy' development. Furthermore, whilst all assessments used qualitative information and assessment techniques, none of the HIAs applied quantitative methods. On the other hand, quantitative techniques (models and overlay mapping) were used in three out of five EIAs/SEAs.

Making judgements on the impact HIAs had on action and implementation was difficult, as these were often prepared outside decision-making processes (opposite to EIAs/SEAs that were all prepared within or in parallel to policy, plan, programme or project decision-making processes). Two of the HIAs were confirmed to have had a more minor impact on subsequent development. Whilst the two EIAs considered were said to have had a moderate impact on the project for which they were prepared, all three SEAs were said to have had a minor impact only.

Currently, HIA is an instrument which is usually not formally/legally required, as opposed to EIA and SEA that are both statutory instruments. Being used voluntarily is one of the reasons for HIA often employing participatory stakeholder HIA workshops, underpinned by desktop studies (i.e. a review of published evidence). In all but one of the cases, where only a desktop study was conducted, potential health impacts were identified through the performance of an HIA workshop. In this context, many HIAs appear to be approaching policy, plan, programme and project-making exercises from the *outside*, making suggestions to those working on them to consider certain aspects in the future, rather than working with them on improving things *within* a decision-making process, as is usually happening with SEA and EIA.

Conclusions and recommendations

This paper explored evidence for how the health role of UGS is considered and supported in planning

interventions through IA, focusing on HIA, SEA and EIA. To start with, it was found that with regards to HIA, there are a number of different approaches that are very different in outlook and purpose. In the interest of clarity there is a need to label approaches consistently.

A key finding is that only those policies, plans, programmes and projects (PPPPs) that have green space development as the main starting point make an explicit connection with health. When green space interventions are not the starting point, the connection made between health and green space is weaker and frequently implicit only. In both cases, though, currently little effort is made to establish evidence for the causal relationships of green space and health. Health is a product of a wide range of environment, social and economic factors, and it would be difficult to attribute any change in health conditions to one particular factor.

Continuing from the previous point, it is also concluded that the HIAs, SEAs and EIAs studied here do not make the most of the methodologies that are available for developing evidence and for monitoring them (Egorov 2016). This may be attributed partly to the fact that the effects of interventions are not usually evident in the short run. However, continuous long-term monitoring (e.g. over a decade) would in most cases be difficult to secure.

Generally speaking, it was established that most HIAs and SEAs/EIAs played a more minor role only and EIAs a moderate role in influencing PPPP decision-making processes, adding moderate value to the issues regarding green space and health.

Two main approaches of HIA, SEA and EIA with regards to UGS interventions and associated health impacts were identified:

- (1) A problem-driven approach, where human health is to be promoted through UGS and where the UGS intervention itself is the main subject of a plan or project. In this context, HIA is often applied, adopting the role of guidance, enhancing communication and awareness amongst stakeholders. Furthermore, at times HIAs also takes the role of a (health) promotional tool, with a tendency towards qualitative analysis and a focus on positive outcomes, rather than negative impacts.
- (2) An impact-driven approach, which focuses on (often negative) impacts of a – usually – non-UGS intervention-specific plan or project and where mostly EIA or SEA are applied. Both, UGS and health will usually be only one of many aspects considered. Here, it is often difficult to isolate impacts on health, and thus health monitoring will be difficult.

One of our main recommendations emerging from the use of these two approaches is that on the one hand, the use of HIA should be extended to assessing impacts of

proposed plans and projects (both UGS- and non-UGS-focused), while EIAs/SEAs should aim at giving more space to a problem-driven approach, being less reactive and more pro-active, explicitly aiming to establish the causal effects of green space interventions on health. Finally, with slightly differing, but highly complementary approaches, there may be a case of integrating HIA and EIA/SEA.

Disclosure statement

No potential conflict of interest was reported by the authors.

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